

# Intensive poultry production: an important hot-spot of multi-resistant *Escherichia coli* in Ecuador

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**Background:** Antimicrobial resistant bacteria are a global healthcare threat related to the overuse of antibacterial compounds. Antibiotics in food animal production are used therapeutically and as growth promoters. These practices increase the selective pressure in animal and environmental microbiomes. Intensive poultry production uses antimicrobial families that could stimulate the selection of bacteria resistant to critical antibiotics used in human medicine. The aim of this study was to evaluate the presence of extended spectrum beta-lactamase (ESBL) producing *E. coli*, their sensitivity to major antibiotics and the presence of *mcr-1* gene in the Ecuadorian poultry production.

**Materials/methods:** Sampling was carried out in four slaughterhouses in Quito (2013-2014). The study included 309 flocks from 91 farms. From each flock one caecum from 25 randomly selected chickens were collected and plated in Tryptone Bile X-glucuronide (TBX®) agar supplemented with cefotaxime 3 mg/L. Two colonies for each caecum were selected and tested for ESBL-production by double disk test. Ninety-one isolates were randomly selected and analyzed for resistance to trimethoprim/sulfamethoxazole (SXT), ceftazidime (CAZ) tetracycline (TE), streptomycin (S), chloramphenicol (C), nitrofurantoin (F), ertapenem (ETP), kanamycin (K), nalidixic acid (NA), doxycycline (DO), amoxicillin/clavulanate (AMC), gentamicin (CN) and ciprofloxacin (CIP). The presence of *bla*<sub>CTX-M</sub>, *bla*<sub>TEM</sub> and *bla*<sub>SHV</sub> genes and colistin resistance *mcr-1* gene were investigated by PCR. Antimicrobial susceptibility profiles were analyzed using heatmap.2 function in R software.

**Results:** All 309 flocks were positive for ESBL-producing *E. coli*. The 91 randomly selected isolates presented a multi-resistant phenotype. Resistance was registered to NA in 93.4 %, TE 88%, S 82.4%, CIP 74.7%, DO 75.8%, F 72.5%, SXT 70.3%, C 68.1%, CN 44%, K 31.9%, AMC 30.8% and CAZ in 24.2%. Resistance to ETP was no observed. The profiles showed high diversity, additionally to the high resistance rates (Figure 1). *bla*<sub>CTX-M</sub> ESBL genes were registered in 95,6% of the isolates. *bla*<sub>CTX-M group 1</sub> was registered in 36.8% (32/87), *bla*<sub>CTX-M group 9</sub> in 23% (20/87) and *bla*<sub>CTX-M group 2</sub> in 6.9% (6/87). *bla*<sub>TEM</sub> was detected in 44% and *bla*<sub>SHV</sub> in 5.5%. Finally, *mcr-1* was present in 3.3% of the isolates (Figure 1).

**Conclusion:** The high resistance rates and the diversity in susceptibility profiles of the studied isolates suggest that poultry production in Ecuador is a hot-spot of antimicrobial resistance. Further research is necessary to establish the capacity of dissemination of these strains into the food chain.

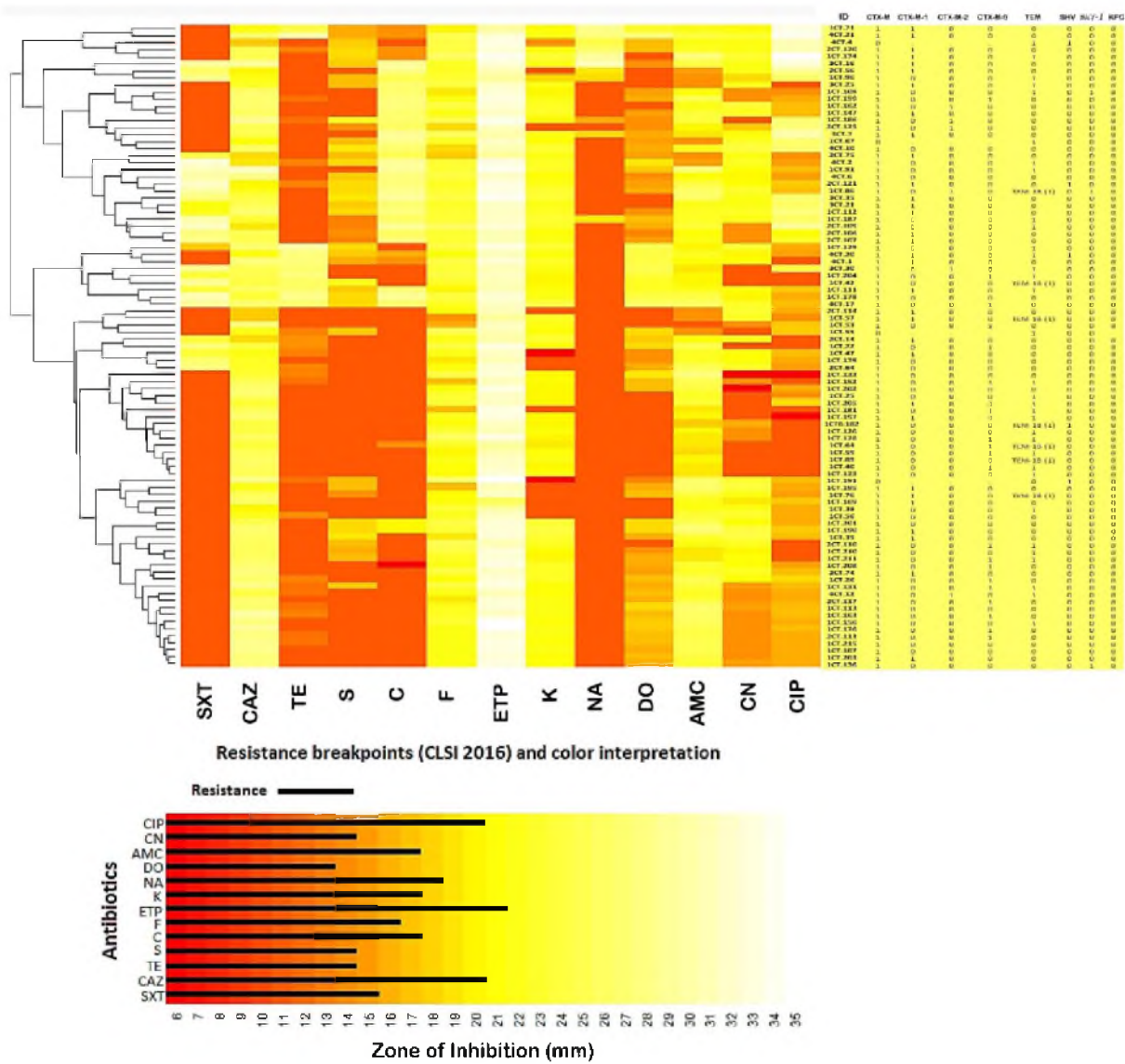


Figure 1. Heatmap of isolates resistance profile.